ANTI-INFLAMMATORY ACTIVITY OF ROOT OF SOLANUM MELONGENA.

J.F. Dadi*, B. N. Shah, D.P. Shah and V. B. Lambole

Department of Pharmacology, Vidyabharti Trust College of Pharmacy, Umrakh, Gujarat, India.

ABSTRACT

Anti-inflammatory activity of the petroleum ether, chloroform, Aqueous and methanol extracts of the root of Solanum melongena was studied in Wistar rats using the carrageenan induced left hind paw edema. The petroleum ether, chloroform, aqueous and methanol extracts at a dose of 300, 400, 500 and 500 mg/kg body wt. shows moderate to significant anti-inflammatory activity. The petroleum ether, chloroform, aqueous and methanol extracts of Solanum melongena reduced the edema induced by carrageenan by 68%, 53%, 74% and 47% respectively on oral administration of 300, 400, 500 and 500 mg/kg body wt., as compared to the untreated control group. Diclofenac sodium at 20 mg/kg body wt. inhibited the edema volume by 79%. The results indicated that the petroleum ether and aqueous extract shows more significant anti-inflammatory activity then chloroform and methanol extracts when compared with the standard and untreated control.

Keywords: Anti-inflammatory, Solanum melongena, Carragennan.

INTRODUCTION

Solanum melongena – solanaceae is used for a long time as an edible vegetable in many countries, and commonly eaten in India. Traditionally, it is believed that the plant is useful in the treatment of inflammatory disorders[1, 2]. On the other hand, a number of previous studies have reported that Solanum melongena possessed central nervous system[3] and visual functions[4]. However, there is a little study regarding its anti-inflammatory effect.

Prolonged uses of both steroidal and non-steroidal anti-inflammatory drugs are well known to be associated with peptic ulcer formation[5]. Hence, search for new anti-inflammatory agents that retain therapeutic efficacy and yet are devoid of these adverse effects is justified. There is much hope of finding active anti-rheumatic compounds from indigenous plants as these are still used in therapeutics. Herbal drugs are being proved as effective as synthetic drugs with lesser side effects.

The enzyme, phospholipase A2, is known to be responsible for the formation of mediators of inflammation such as prostaglandins and leukotrienes which by attracting
polymorphonuclear leucocytes to the site of inflammation would lead to tissue damage probably by the release of free radicals. Phospholipase A2 converts phospholipids in the cell membrane into arachidonic acid, which is highly reactive and is rapidly metabolized by cyclooxygenase (prostaglandin synthase) to prostaglandins, which are major components that induce pain and inflammation\textsuperscript{[6,7]}. Arachidonic acid is also converted to leukotrienes via lipoxygenase enzyme.

The aim of this present study is to investigate and evaluate the anti-inflammatory effect of \textit{Solanum melongena} extracts on carrageenan induced inflammation in rats and provide scientific evidence for development of \textit{Solanum melongena} as a potential natural oral anti-inflammatory agent or functional food.

**MATERIALS AND METHODS**

**Plant Material:**
The root of \textit{Solanum melongena} were collected from the Godhra, identified and authenticated by Prof. B.R. Patel, Dept. of Botany, PG Science College, Bardoli. The roots were shade dried at room temperature for 10 days and coarsely powdered with the help of a hand-grinding mill and the powder was passed through sieve No. 60.

**Preparation of the Extract**
The powder of root of \textit{Solanum melongena} was extracted by continuous hot extraction process using soxhlet apparatus with petroleum ether, chloroform, methanol and water\textsuperscript{[8]}. After extraction, the extracts were concentrated and the extractive values were calculated with reference to the air-dried drug. The dried extracts were subjected to various chemical tests to detect the presence of different phytoconstituents.

**Animals**
Wistar rats of either sex and of approximately the same age, weighing about 150-200 g were used for the study. They were housed in polypropylene cages and fed with standard diet and water. The animals were exposed to alternate cycle of 12 h of darkness and light each. Before each test, the animals were fasted for at least 12 h. The experimental protocols were subjected to the scrutinization of the Institutional Animal Ethics Committee and were cleared by the same.
Acute Toxicity Studies
The animals were divided into control and test groups containing six animals each. The control group received the vehicle while the test groups received graded doses of extracts orally (p.o.) and were observed for mortality till 48 h and the LD50 was calculated\[9\].

Carrageenan Induced Rat Paw Edema
Anti-inflammatory activity was assessed by the method described by Sheetal S chaudhri\[10\]. The rats were divided into six groups of six animals each. First group (control) received 5 ml/kg body wt. of normal saline; second group (standard) received 20 mg/kg body wt. (i.p) diclofenac sodium, third group received petroleum ether extract (300 mg/kg body wt., p.o.), fourth group received chloroform extract (400 mg/kg body wt, p.o.), fifth group received aqueous extract (500 mg/kg body wt, p.o) and group six received methanol extract (500 mg/kg body wt, p.o) of Solanum melongena, respectively. After 1 h, the rats were challenged with subcutaneous injection of 0.1 ml of 1 % w/v solution of carrageenan (Sigma chemical co, St. Louis MO, USA) into the plantar side of the left hind paw. The paw was marked with ink at the level of lateral malleolus and immersed in solution up to the mark. The plethysmograph apparatus used for the measurement of rat paw volume was of UGO Basil company. The paw volume was measured immediately after injection (0 h) and then every hour till 4 h after injection of carrageenan to each group. The difference between the initial and subsequent reading gave the actual edema volume. Percent inhibition of inflammation was calculated using the formula,

\[ \% \text{ inhibition} = 100 \left(1 - \frac{V_t}{V_c}\right) \]

Where ‘Vc’ represents edema volume in control and ‘Vt’ edema volume in group treated with test extracts.

Statistical Analysis
All values were expressed as mean. The data were statistically analyzed using one way ANOVA followed by Students ‘t’ test and differences below p < 0.05 are considered as significant.

RESULTS
The LD50 was found to be 3000 mg/kg, 4000 mg/kg, 5000 mg/kg, and 5000 mg/kg for petroleum ether, chloroform, aqueous and methanol extract of Solanum mlongena. So the 1/10 of LD50 dose was considered as an effective dose.

The effect of petroleum ether, chloroform, aqueous and methanol extracts of Solanum melongena on carrageenan induced edema in rats is shown in Table 1 and Figure 1. The results obtained indicate that the chloroform and methanol extract had significant anti-inflammatory activity in rats, while petroleum ether and aqueous extract had more significant anti-inflammatory activity. The petroleum ether, chloroform, aqueous and methanol extracts of Solanum melongena reduced the edema induced by carrageenan by 68%, 53%, 74% and 47% respectively on oral administration of 300, 400, 500, 500 mg/kg body wt, as compared to the untreated control group. Diclofenac sodium at 20 mg/kg body wt inhibited the edema volume by 79%.

**Table 1: Effect of Various Extracts of Solanum Melongena on Carrageenan Induced Rat Paw Edema.**

<table>
<thead>
<tr>
<th>Group</th>
<th>0 min</th>
<th>1 hr</th>
<th>2 hr</th>
<th>3 hr</th>
<th>4 hr</th>
<th>% inhibition at 4th hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>2.39</td>
<td>2.41</td>
<td>2.4</td>
<td>2.39</td>
<td>2.58</td>
<td>0</td>
</tr>
<tr>
<td>Standard</td>
<td>2.64</td>
<td>2.73</td>
<td>2.65</td>
<td>2.59</td>
<td>2.68</td>
<td>79</td>
</tr>
<tr>
<td>Chloroform</td>
<td>2.35</td>
<td>2.62</td>
<td>2.59</td>
<td>2.49</td>
<td>2.44</td>
<td>53</td>
</tr>
<tr>
<td>Aqueous</td>
<td>2.63</td>
<td>2.69</td>
<td>2.53</td>
<td>2.49</td>
<td>2.68</td>
<td>74</td>
</tr>
<tr>
<td>Pet.ether</td>
<td>2.41</td>
<td>2.48</td>
<td>2.36</td>
<td>2.33</td>
<td>2.47</td>
<td>68</td>
</tr>
<tr>
<td>Methanol</td>
<td>2.72</td>
<td>2.78</td>
<td>2.67</td>
<td>2.62</td>
<td>2.82</td>
<td>47</td>
</tr>
</tbody>
</table>
CONCLUSIONS

Due to the increasing frequency of intake of NSAID’s and their reported common side effects, there is a need to focus on the scientific exploration of herbal drugs having fewer side effects. So, there is a continuous search for indigenous drugs, which can provide relief to inflammation. To give a scientific validation to this plant, an attempt was made to study the anti-inflammatory activity.

Carrageenan induced inflammation is a biphasic phenomenon\[11\]. The first phase of edema is attributed to release of histamine and 5-hydroxy-tryptamine. Plateau phase is maintained by kinin like substances and second accelerating phase of swelling is attributed to prostaglandin like substances. The knowledge of these mediators involved in different phases is important for interpreting mode of drug action.

Thus it can be concluded that the root of the Solanum melongena possess significant anti-inflammatory activity in rats. Further studies involving the purification of the chemical
constituents of the plant and the investigations in the biochemical pathways may result in
the development of a potent anti-inflammatory agent with low toxicity and better
therapeutic index.

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For Correspondence:
Dadi Jenul
Email: jenuldadi111@gmail.com